

Payment Liquidity in the Light of Changes in the Central Bank Toolkit*

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This study examines the impact of the changes implemented by the Magyar Nemzeti Bank in the central bank toolkit on the liquidity of payment system¹ participants over the period between 2020 and the end of 2023 H1. In response to the economic challenges of recent years, the central bank toolkit changed significantly during the period under review. While the economic and financial crisis stemming from the Covid-19 pandemic required interbank liquidity expansion measures, in 2022 steps to absorb excess liquidity were necessary to fine-tune monetary transmission and achieve and maintain price stability. The analysis focuses on the impact of specific toolkit adjustments on the liquidity of the payment system, while also demonstrating why interbank liquidity is separated from payment system liquidity, and which toolkit modifications have typically had a significant impact on the liquidity of the payment system.

Journal of Economic Literature (JEL) codes: E42, E51, E52, G21

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1. Introduction

Liquidity is an elusive notion in the field of finance, with numerous concepts and definitions being distinguished (Nikolaou 2009). Analyses of liquidity differentiate between central bank liquidity, funding liquidity and market liquidity (Kolozsi – Horváth 2020). As individual liquidity types may differ significantly from one another, it is important to clarify which approach to liquidity is applied in a particular analysis (Goodhart 2008). In this analysis, we examine developments in the aggregate payment liquidity of the direct participants² (hereinafter: ‘participants’) of VIBER (Real-Time Gross Settlement System) in the light of changes in the central bank

* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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¹ Real-time Gross Settlement System and Interbank Clearing System.

² Under the applicable business terms and conditions, VIBER participants may include, *inter alia*: domestic credit institutions, other payment service providers providing payment services in Hungary, investment firms, financial infrastructure operators (i.e. system operators), CLS Bank International and the MNB.

toolkit, which apply to the counterparties defined in the Terms and Conditions of the Operations of the Central Bank in Forint and Foreign Currency Markets. While this study does not examine in detail the evolution of turnover in VIBER, it should be noted that turnover in VIBER amounted to several times the value of Hungarian GDP in 2020, 2021 and 2022. During the period under review, in respect of the central bank balance sheet, certain modifications to the central bank toolkit can be considered liability-driven, as the relevant international literature points out. These typically include various lending schemes and asset purchase programmes. Some solutions, however, are asset-driven, which are used to absorb excess liquidity via deposit instruments (*Gray 2006*).

The liquidity of VIBER participants is essentially composed of two items. The first component is the payment account balance of participants held with the Magyar Nemzeti Bank (central bank of Hungary, MNB) for the purpose of conducting payment transactions (hereinafter: 'account balance'), which, besides settling payment transactions, is maintained for the purpose of complying with the reserve requirement ratio, as well as the instant settlement account balance (AFR account balance), which may be used for the execution of instant payments. The account balance and the instant settlement account balance can change significantly within a day, as they are constantly being modified by the participants' payment transactions. These balances are augmented by payment transactions entailing revenues for the specific participant; moreover, the central bank instruments applied for monetary policy purposes, such as overnight or other short-term deposit instruments, can modify the balances significantly. This is because recourse to these instruments and the fixing of the stocks concerned typically take place in the hours leading up to the closing of VIBER, while the next day's release takes place in the period after the opening of VIBER. Consequently, the balance as at the closure and opening of VIBER may not necessarily provide an accurate view of the amount of liquidity available for intraday use. The second component of liquidity is the intraday credit line received by participants against collateral pledged to the MNB, which is equal to the portion of the pledged collateral that can be used for payment transactions. The availability and use of the thus allocated credit line is free of charge during the day (*MNB 2023a*). The part of the pledged collateral that can be used for payment transactions is also determined by the Terms and Conditions of the Operations of the Central Bank in Forint and Foreign Currency Markets. As mentioned above, it is also important to note that, in addition to VIBER liquidity, the instant settlement account balance reserved for instant payments in the Interbank Clearing System (hereinafter: 'ICS') also expands the liquidity of the payment system. With the launch of instant clearing in March 2020, there was a change in the VIBER balance of accounts, but it is also important to note that the launch of the new payment solution did not reduce the liquidity of the payment system; it was simply split into a VIBER balance of accounts and an ICS instant settlement account balance.

The sum of these items determines *the liquidity of the payment system, which may be different from the liquidity of the banking sector or the financial system used for the purposes of monetary policy*, and indeed, their volume may diverge in response to changes to the central bank's monetary policy instruments. An example of this was seen in October 2022, when the long-term liquidity-absorbing deposit,³ activated as part of a central bank toolkit modification, was used to sterilise interbank liquidity, but as it was included in the scope of eligible collateral for payment transactions, it increased the intraday credit line and payment liquidity. In the period 2020–2023, eligible collateral also included government bonds, discount Treasury bills, mortgage bonds, investment units, bonds, foreign issued Hungarian securities, corporate loans, long-term liquidity-absorbing deposits, interest-bearing Treasury bills and the collateral value of SME loans issued under the Funding for Growth Scheme (FGS), although the latter was not eligible as collateral for payment transactions.⁴

In the analysis, we examine the modifications to the central bank toolkit after 2018 and 2019, which were relatively balanced years in terms of liquidity, as these changes had significant impacts in some cases. In addition to tracking the changes in the account balance, the instant settlement account balance and the intraday credit line, we also examine the evolution of the pledged collateral portfolio, the portfolio of overnight and other short-term deposit facilities and any transaction queues and maximum utilisation of the intraday credit line (MICL) arising in the VIBER system. The primary objective of the analysis is to identify the scope of central bank toolkit modifications that may have a major impact on liquidity.

2. Methodology

2.1. Payment systems under review

VIBER is a domestic payment system operated by the MNB, primarily for the settlement of high-value⁵ urgent, HUF-based payments, which are final and irrevocable once they are settled automatically in real time, in accordance with the provisions of Act XXIII of 2003.⁶ Money market operations – i.e. the so-called interbank items – account for the bulk of the turnover. VIBER participants are institutions that hold an account with the MNB. Payment orders are executed subject to the availability of sufficient collateral. The collateral is the positive account balance and the intraday credit line provided by the MNB based on the collateral pledged for payment transactions, and the intraday credit line can be adjusted

³ A floating-rate deposit facility with a maximum tenor of 6 months.

⁴ The exact definition of eligible collateral is determined by the Terms and Conditions of the Operations of the Central Bank in Forint and Foreign Currency Markets.

⁵ In 2022, the average transaction value was HUF 1,267 million.

⁶ Act XXIII of 2003 on Settlement Finality in Payment and Securities Settlement Systems.

during the day. Efficient liquidity management is supported by the central queue management system, the use of priorities, the algorithm unlocking gridlocks, and the VIBER Monitor service (*MNB 2023b*). VIBER's Central Accounting System (CAS) distinguishes a number of priority codes, which VIBER participants use to prioritise the payment orders they initiate, thus facilitating the smooth execution of payment transactions. Pending, non-rejected payment orders are queued in CAS according to their priority relying on the queue management mechanism, and CAS notifies the participant if the transaction at the top of the payment queue does not move for 90 seconds due to insufficient funds. Gridlock occurs if the payment orders of two or more participants are in a queue due to insufficient funds while they have a debt to each other. Gridlocks can be resolved by supplying more liquidity or by using a gridlock resolution algorithm. The frequency of starting the algorithm can be parameterised; at present, it checks queued transactions every 10 minutes, while ensuring that the sequence of payment orders does not change during the process. The VIBER Monitor service enables participants to obtain information on their queuing and executed transactions and to modify, delete or re-prioritise their queuing orders (*MNB 2023a*).

The ICS processes and clears domestic interbank payment transactions in HUF. There are three different platforms for clearing services: overnight clearing, intraday clearing and instant clearing. While in the case of overnight clearing a transaction submitted before midnight will only be cleared on the next business day, in the case of intraday clearing, items will be cleared on the day of the transaction, unless exceptional circumstances arise.⁷ With instant clearing, transactions are not cleared in batches but on a fully individual basis 24 hours a day. Instant transactions – which have a HUF 20 million limit from 1 September 2023⁸ – are covered from the originator clearing member's instant settlement account balance (*GIRO 2021*).

The liquidity in VIBER and the ICS is essentially determined by the same factors; therefore, any changes in these factors may equally affect both systems and their participants. While the intraday and overnight clearing of the ICS is settled in VIBER from VIBER's payment liquidity, settlement in the case of ICS instant clearing is different, resulting in partial sharing of the liquidity between the platforms that settle payment transactions. In the case of instant clearing, participants pre-finance the funds on a technical omnibus account held with the MNB, and the balance of participants' instant settlement account are registered by GIRO Zrt. on behalf of the MNB. In addition to the transactions executed, the value of such can be adjusted by transferring the VIBER account balance, and outside of VIBER operating hours (6 p.m. – 7 a.m.) liquidity can be added by way of central bank lending, i.e. by instant credit provided based on the securities portfolio pledged to the MNB (*MNB 2022a*).

⁷ Two hours is required on average for a transfer to reach the bank account of the beneficiary from the time of debiting the payer's bank account (*Császár 2015*).

⁸ From which the clearing members may deviate upwards on a bilateral basis.

This analysis examines the impact of modifications to the MNB's monetary policy toolkit, focusing on the liquidity of the VIBER and ICS payment systems.

2.2. Raw data and indicators

In its capacity as VIBER's operator, the MNB continuously records key data on the operation and attributes of the system (Bodnár *et al.* 2015). In addition, credit institutions subject to reserve requirements are required by law⁹ to provide statistical balance sheet data to the MNB and accordingly, most of the information needed for this analysis was available, while details on modifications to the central bank toolkit are publicly available on the MNB's website.

The main focus of the analysis is on changes in the end-of-day¹⁰ account balances, instant settlement account balances and intraday credit lines of VIBER participants, as well as changes in the volume of overnight deposit facilities¹¹ (O/N central bank deposit, preferential deposit, QuickTender) in the MNB's central bank instruments. We can extract important information from the changes and fluctuations in these balances, as well as from the co-movement of values. Modifications to the central bank toolkit can significantly alter the relationship between the balance and the intraday credit line, for example, if the scope of the eligible collateral is changed or a decision is made on the reserve requirement ratio. To investigate this interaction, we analysed the correlations between account balances and available liquidity (instant settlement account balance, account balance and intraday credit line) to see the relationship arising from each monetary policy toolkit adjustment between the VIBER account balance, the instant settlement account balance and the intraday credit line.

$$\text{Correl}(X, Y) = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sqrt{\sum(x - \bar{x})^2 \sum(y - \bar{y})^2}} \quad (1)$$

x = Sum of end-of-day account balances and instant settlement account balances on a specific day.

\bar{x} = Average of end-of-day account balances and instant settlement account balances in a specific period.

y = Sum of end-of-day liquidity on a specific day.

\bar{y} = Average of the end-of-day liquidity of a specific period.

⁹ MNB Decree No. 10/2005 (VI. 11.).

¹⁰ Pursuant to MNB Decree No. 36/2022 (IX. 15.), the account balances shown on the daily account statement are used for the purposes of calculating compliance with the reserve requirement ratio.

¹¹ Although it has been noted that the balance of overnight central bank deposits should not be used as collateral for central bank credit under the MNB's Business Terms and Conditions, since short-term deposits are typically fixed in the hours immediately preceding the closing of VIBER and are released following the opening of VIBER on the next day, the liquidity is available to VIBER participants during the day; consequently, in order to present the actual account balance, the midnight balances are presented in conjunction with short-term deposit holdings.

Despite the effectiveness of the queue management mechanism, some queuing payment orders occur primarily due to insufficient funds. By analysing queuing developments, we can see from a different perspective whether there is sufficient liquidity in the payment system, because, in addition to examining the static end-of-day status of the VIBER account balance, the instant settlement account balance and the intraday credit line, the number of queuing items provides information on whether payment transactions were executed smoothly during VIBER operating hours (7 a.m. – 6 p.m.), i.e. this analysis provides information on intraday processes. A significant increase or decline in the number of payment orders in the queue following a change in the central bank toolkit may offer important information on the impact of certain adjustments to the monetary policy instruments on the liquidity of the payment system and on payment transactions. However, it should not be overlooked that the liquidity management of individual VIBER participants can vary significantly; therefore, in some cases the number of queuing transactions of a single participant may skew our conclusions about the overall VIBER system.

The analysis of the maximum utilisation of intraday credit line (MICL) serves a similar purpose as the analysis of queuing transactions. If a VIBER participant has insufficient funds on the VIBER account to settle an outgoing payment order, the participants will be entitled to take recourse to an intraday credit line¹² – which is not the same as an overnight (O/N) loan. If the sum of a participant’s intraday credit line and account balance is insufficient to settle the payment order, the transaction will be queued, but it will also provide relevant information if a payment order is settled against a credit line rather than being queued. Similarly, by examining intraday MICL values, we obtain information on the flows, i.e. on the payment transactions that take place during VIBER operating hours, rather than on the static VIBER account balance and the end-of-day closing balance of intraday credit lines.

$$MICL = \frac{FNH}{NH} \quad (2)$$

NH = The daily intraday credit line of a specific bank on a specific day.

FNH = Value of the maximum utilisation of intraday credit line of a specific Bank on a specific day.

¹² The scope of eligible clients is defined in the prevailing Terms and Conditions of the Operations of the Central Bank in Forint and Foreign Currency Markets.

2.3. Horizon under review and relevant key central bank decisions

The analysis studies the effects of modifications to the central bank toolkit in the period between the beginning of 2020 and 2023 H1. Over the selected time horizon, significant economic challenges had to be addressed, and as such, the period under review was particularly active in terms of modifications to the central bank toolkit (Table 1).

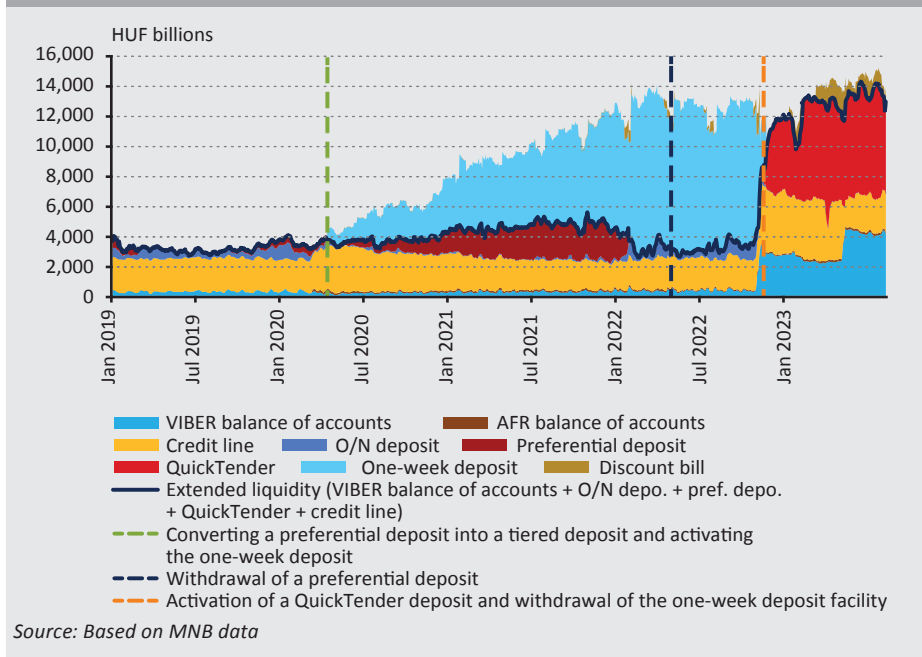
Table 1	
Key central bank decisions affecting the central bank toolkit	
Date	Decision
16 March 2020	Activating one-week FX swap tenders providing forint liquidity to maintain the appropriate level of liquidity for the banking sector and to smooth liquidity developments.
17 March 2020	Expanding the scope of eligible collateral with corporate loans effective from 23 March.
24 March 2020	Introducing a new fixed-rate collateralised loan instrument with maturities of 3, 6 and 12 months as well as 3 and 5 years, with unlimited liquidity. Exemption from the consequences of non-compliance with reserve requirements from the reserve maintenance period starting in March.
1 April 2020	Activating a one-week deposit facility bearing interest at the central bank base rate.
7 April 2020	Making the interest rate corridor symmetrical. Increasing the interest rate on O/N and one-week collateralised loans from 0.9 per cent to 1.85 per cent, while the base rate and the O/N deposit rate remained unchanged. Launching a government security purchase programme in the secondary market, and re-launching the mortgage bond purchase programme.
7 April 2020	Launching the Funding for Growth Scheme Go!, increasing the previous amount by HUF 1,000 billion. Including HUF 500 billion undrawn under the FGS fix scheme, the MNB made available HUF 1,500 billion of cheap and stable source of lending to the SME sector under the consolidated FGS Go! scheme. The maximum maturity of refinancing loans was increased from 10 years to 20 years, and the maximum loan amount available to SMEs was raised to HUF 20 billion from HUF 1 billion.
7 April 2020	Raising the maximum amount of exposure to a given group of corporations from HUF 20 billion to HUF 50 billion under the Bond Funding for Growth Scheme. Raising the maturity of securities eligible for purchase under the scheme from 10 to 20 years. Converting the preferential deposit facility into a tiered interest rate facility.
30 April 2020	Accepting investment units as collateral.
August 2021	Launching the Green Mortgage Bond Purchase Programme.
1 September 2021	Removing investment units from the scope of eligible collateral.
1 April 2022	Phasing out the preferential deposit facility.
1 October 2022	Activating the long-term liquidity-absorbing deposit. Raising the required reserve ratio to 5 per cent and reintroducing the penalty for reserve balance deficiency.
14 October 2022	Activating the QuickTender. Phasing out the one-week deposit facility.
1 April 2023	Raising the reserve requirement ratio to 10 per cent.
<i>Source: MNB</i>	

2.4. Overview of the central bank toolkit for the period under review

During the period covered by the analysis, a number of central bank deposit facilities were available to VIBER participants under various schemes, which, as mentioned above, may have had an impact on developments in payment liquidity. In this part of the analysis, we present the extent to which certain deposit facilities may have influenced changes in the volume of payment liquidity.

As mentioned before, the main focus of the analysis is on changes in the end-of-day account balances, instant settlement account balances and intraday credit lines of VIBER participants, as well as changes in the volume of overnight deposit facilities (O/N central bank deposit, preferential deposit, QuickTender) in the MNB's monetary policy instruments.

Figure 1
Developments in VIBER participants' account balances, instant settlement account balances, intraday credit lines and extended liquidity and in the MNB's deposit facilities between 2019 and 2023 H1



In the analysis the evolution of extended liquidity will be described in detail; in this section we present elements that belong neither directly to the 'classical' components of payment liquidity that we have examined in detail,¹³ nor to the

¹³ The classic elements include, *inter alia*, the account balances and the intraday credit line mentioned above.

category of overnight (O/N) deposit instruments. Among the instruments shown in *Figure 1*, one-week deposits and discount bills are not available intraday to VIBER participants for their payment transactions, and are not included in the collateral eligible for acceptance by the MNB, and as such, they did not increase the intraday credit line. In the analysis, these portfolios were not included in the extended liquidity, but it is important to note that the one-week deposit in particular – which peaked at over HUF 10 billion in mid-2022 – provided a form of liquidity buffer that, if properly planned, allowed VIBER participants to transfer significant amounts of funds on a weekly basis into instruments that enabled them to execute payment transactions. Similarly, from the perspective of payment liquidity, discount bills – which, except for a few cases, are typically announced with a maturity of 1 week – are instruments which include some portfolios that may be channelled into liquid assets on a weekly basis if needed.

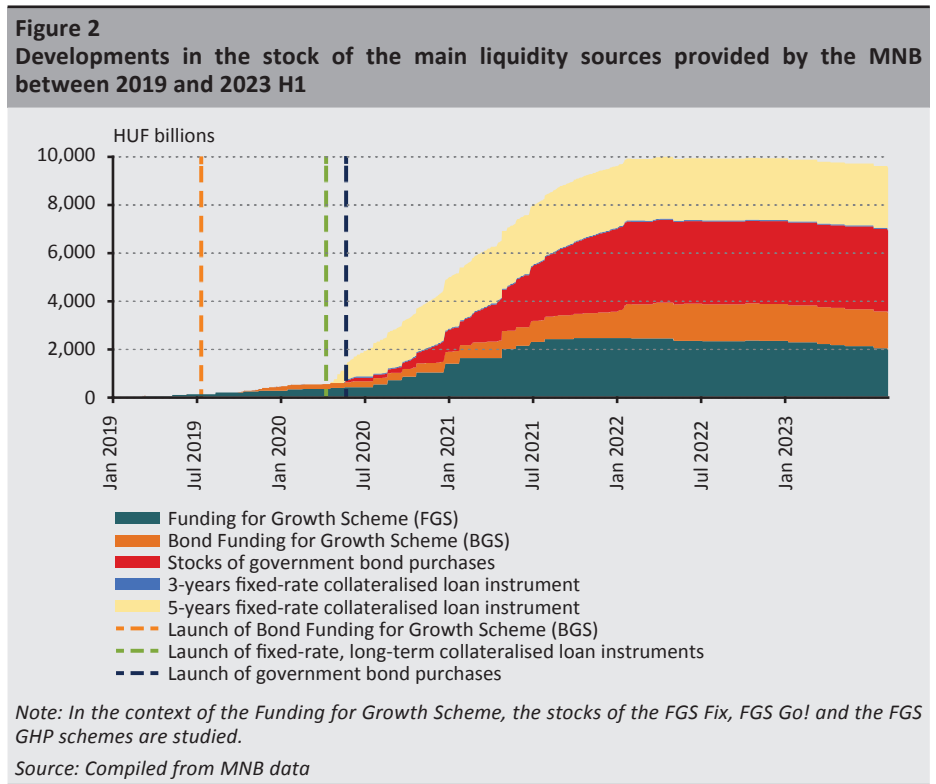


Figure 2 shows the main sources of liquidity provided by the MNB, through which part of the liquidity injected into the banking sector could also be channelled into some elements of the liquidity of the payment system. The Funding for Growth Scheme was announced by the MNB in 2013 in order to mitigate the disturbances in lending to small and medium-sized enterprises, to strengthen financial stability

and to reduce Hungary's external vulnerability. With the FGS Fix Scheme, which was launched on 1 January 2019 as part of the FGS, and the FGS Go!, which commenced on 20 April 2020, the MNB aimed to improve the health of the domestic SME lending structure by easing access to long-term, fixed-rate loans for micro, small and medium-sized enterprises. The last addition to the FGS came on 4 October 2021, when the MNB launched the FGS Green Home Programme (FGS GHP) for the purpose of promoting the integration of environmental sustainability (green) aspects into the domestic housing market, which may also contribute to stimulating demand for green homes and thus to also boosting the supply (*MNB 2022b; MNB 2022c; MNB 2022d*). Launched on 1 July 2019, the Bond Funding for Growth Scheme (BGS) aimed to help diversify domestic corporate debt by raising the liquidity of the corporate bond market, thereby enhancing the effectiveness of monetary transmission (*MNB 2022e*). In accordance with the 7 April 2020 decision of the Monetary Council, the MNB launched a secondary market government bond purchase programme. In the framework of the government bond purchase programme, the MNB announced a variable-price government bond auction from 4 May 2020 until further notice, and purchased fixed-rate, HUF-denominated government securities in the form of spot securities sales on the secondary market, thus improving the liquidity supply of the banking sector (*MNB 2020c; Ábel et al. 2016*). In order to ease the financial market strains caused by the Covid-19 pandemic, on 24 March 2020 the Monetary Council decided to take liquidity-providing measures. The MNB introduced a new fixed-rate collateralised loan instrument with maturities of 3, 6 and 12 months, as well as 3 and 5 years, with an unlimited credit line. The long-term collateralised loan instrument provided banks with a predictable, fixed-rate source of funding, supported liquidity in the corporate and household credit markets and in key financial markets, helped to mitigate financial market turbulence and contributed to the stability of the financing environment (*MNB 2020a; MNB 2020b*).

3. Findings

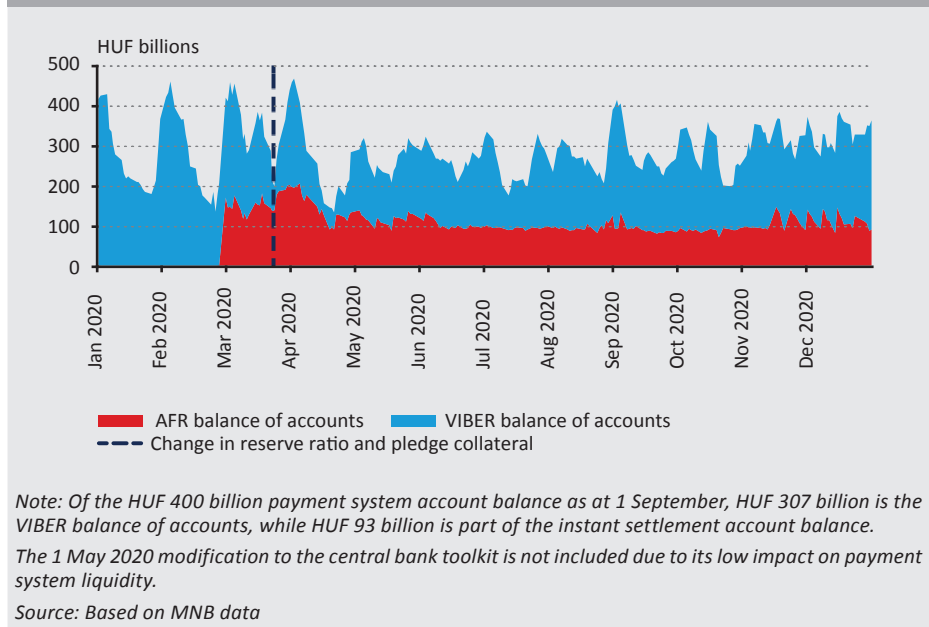
3.1. The year 2020

In response to the market turbulence caused by the Covid-19 pandemic in 2020, in March and April the MNB implemented a number of changes in its central bank toolkit. In order to increase the liquidity of the banking sector, several decisions were made such as exempting VIBER participants from the legal consequences of non-compliance with the reserve requirement, expanding the scope of eligible collateral, activating new loan and deposit facilities, introducing a programme for the purchase of government securities on the secondary market and launching the Funding for Growth Scheme Go! (*Table 1*).

In parallel with these modifications to the central bank toolkit, the liquidity of the VIBER payment system increased from HUF 2,300–2,500 billion at the beginning of

the year to HUF 3,000–3,100 billion in 2020 Q2, and stabilised at HUF 2,700–2,800 billion by the end of the year. By contrast, the volume of the extended liquidity rose to nearly HUF 4,500 billion from HUF 3,800 billion during the year, thanks to the intraday availability of funds deposited to preferential deposits for payment purposes. This central bank instrument was converted to a tiered-rate facility in May 2020. The midnight level of the VIBER balance of accounts dropped sharply during the year, partly in relation to the launch of the instant clearing of the ICS, as technically speaking, the liquidity used by participants for instant payments is separate from the VIBER account balance. In consideration of interbank payment methods, from a flow perspective, the launch of instant payments technically splits the liquidity needed for execution, but overall this separation does not affect participants’ payment liquidity. The decision of 24 March, namely, that non-compliance with the 1-per cent reserve requirement ratio will not lead to legal consequences, played a major role in the decline in the midnight level of the VIBER balance of accounts. A comparison between the average midnight levels of the account balances for the three weeks preceding (2 March – 22 March 2020) and the three weeks following (25 March – 15 April 2020) the effective date of the decision on the reserve requirement reveals that the decline amounted to 32.4 per cent. As a result, the level of the VIBER balance of accounts decreased significantly (Figures 3 and 4).

Figure 3
Aggregated, midnight account balance and aggregated, midnight balance of the instant settlement account (AFR) of VIBER participants – 2020



The significant changes in the instant settlement account balance (AFR account balance) are mainly due to the adjustment period following the implementation of the system. This shows that participants maintained a higher balance on their instant settlement account on average than would have been justified by their transactions.¹⁴ Modifications to the central bank toolkit did not have a clear impact on the instant settlement account balance.

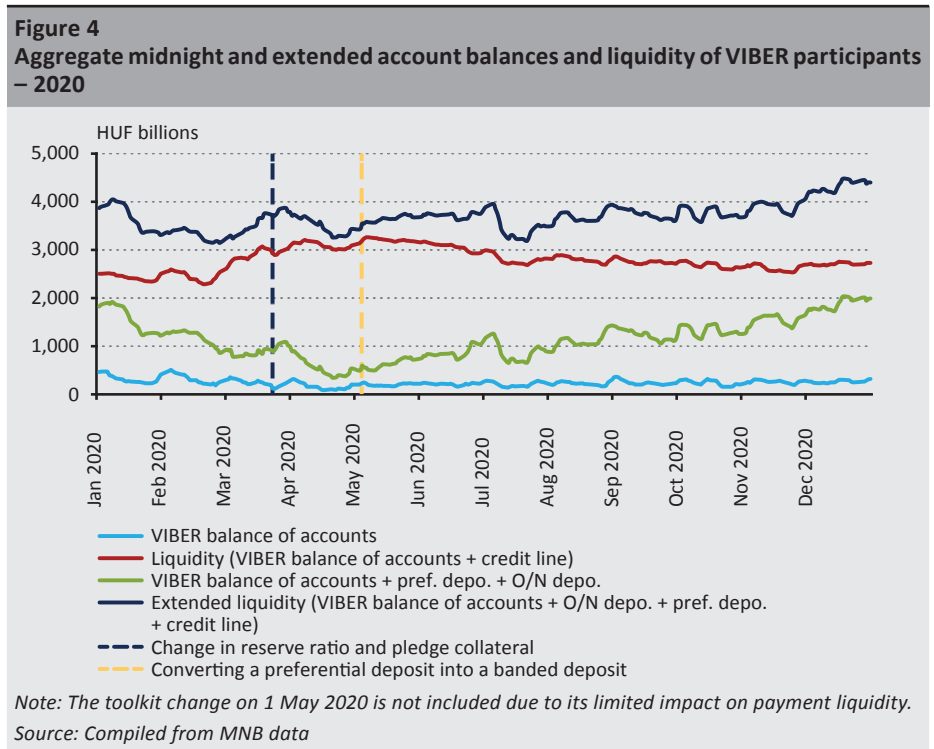
In order to address the market turbulence caused by the Covid-19 pandemic and to increase liquidity, effective from 27 March 2020 the MNB extended the scope of eligible collateral to include corporate loans, investment units, and HUF-denominated corporate bonds and mortgage bonds with contracted market makers.

In addition to the liquidity-providing measures adopted by the central bank, the 10-per cent rise in the liquidity of VIBER in 2020 also reflects the increase in the eligible collateral, as the payment liquidity of VIBER is composed of the account balance on the one hand and of the intraday credit line on the other hand (i.e. the part of the pledged collateral that can be used for payment purposes). The decline in the balance of accounts on the back of the change in the reserve requirement ratio was offset by the increase in the collateral volume from 2020 Q2 (*Figure 5*). The primary objective of the change in the reserve requirement ratio was to partially release liquidity in the banking sector. The 14-per cent change in the extended liquidity value during the year was due to a change in the conditions for the preferential deposit, the volume of which amounted to HUF 1,500–1,600 billion per day by the end of 2020, thanks to the activity of VIBER participants.

In the first two months of 2020, midnight account balances (the payment account balance and the instant settlement account balance) and payment liquidity exhibited a high correlation (0.73), and then, following the toolkit modifications affecting the reserve requirement ratio and the scope of eligible collateral, as well as the launch of instant clearing, the co-movement weakened for the remaining 10 months of the year, showing a correlation value of 0.16. This also demonstrates that various modifications to the monetary policy instruments may have different effects on the individual components of liquidity. While the easing of the reserve requirement ratio reduced the VIBER balance of accounts, extending the scope of eligible collateral increased the intraday credit line; thus, overall, developments in the liquidity of the VIBER system reflected the simultaneous occurrence of different effects. It should be noted that, examining the same relationship between the account balance (supplemented by the portfolio of preferential and O/N central bank deposits) and the extended liquidity

¹⁴ This is also due to the cost of taking recourse to the instant credit instrument, because while a VIBER member can use its intraday credit line free of charge – as long as it is repaid by the closure of VIBER – at present, the interest rate on instant credit equals the O/N lending rate plus 200 basis points. See: *Announcement on fees, extra fees, commissions, postal and other costs on payment orders other than cash transactions relating to bank accounts managed by the Magyar Nemzeti Bank, and the order of discharging fees, costs and interest, as well as FX exchange rate margins*. <https://www.mnb.hu/letoltes/hirdetmeny-20240101.pdf>. Downloaded: 31 January 2024.

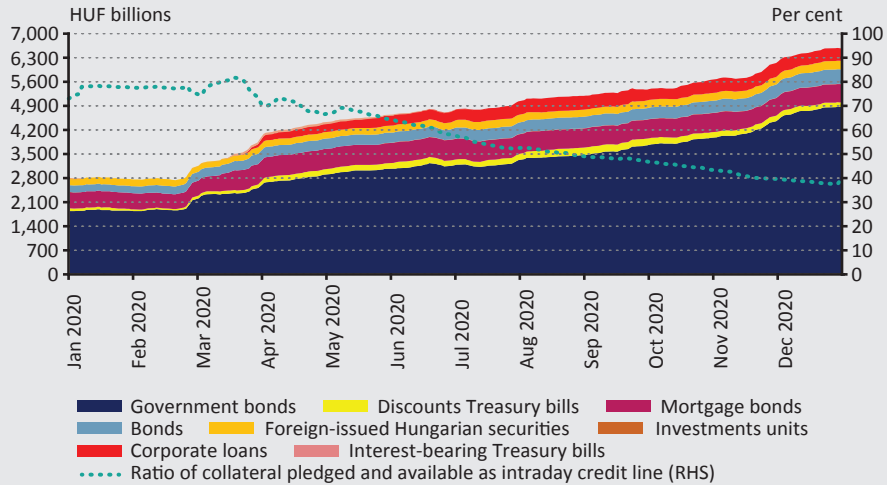
level, we find that prior to the decision on the reserve requirement ratio, the co-movement of the account balance and the extended liquidity showed a correlation of 0.99. This indicates that the value of preferential deposits and O/N deposits play a highly dominant role in liquidity during the operating hours of VIBER, while the correlation value dropped to 0.84 after the change in the required reserve ratio. This is because, despite the dominant role of the preferential deposit and the O/N deposit, changes in the intraday credit line and the midnight account balance had already reduced the co-movement, albeit only moderately.



The expansion of the liquidity of the VIBER payment system is also partly due to the increase in the scope of eligible collateral. In order to boost interbank liquidity, the MNB extended the scope of eligible collateral to corporate loans from 27 March 2020, and to investment units from 1 May 2020 (Figures 4 and 5). Accepting loans as collateral generates information for the central bank on the quality of commercial bank loans, which helps the central bank to rapidly provide liquidity in the event of a liquidity shock (Koulischer – Van Roy 2017).

Partly as a result of the change in the central bank toolkit, the share of mortgage bonds, bonds and foreign-issued Hungarian securities in the portfolio of pledged collateral decreased, while the share of government securities rose to 73.33 per cent from 65.55 per cent. By the end of the year, corporate loans accounted for 5.81 per cent of the value of pledged collateral (Figure 6, MNB 2021).

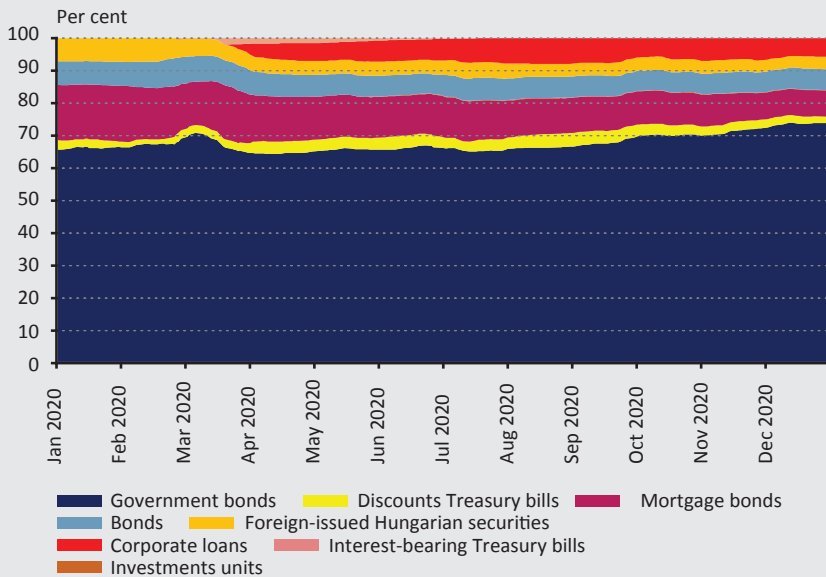
Figure 5
Ratio of pledged collateral to the intraday credit line – 2020



Note: For the ratio of intraday credit line: Ratio of credit line available for payments to the total portfolio of pledged collateral (excluding the collateral value of loans disbursed to SMEs under the FGS). 72.9 per cent of the HUF 2,764 billion pledged collateral on 1 January can be used for payment purposes.

Source: Compiled from MNB data

Figure 6
Breakdown of the composition of the pledged collateral portfolio – 2020



Source: Compiled from MNB data

Starting from May, there was a significant contraction in the maximum utilisation of intraday credit line (MICL) in 2020. As a result, the aggregate monthly average MICL of VIBER participants fell from 12.3 per cent in April¹⁵ to 7 per cent in August, before rising again somewhat by the end of the year. This is consistent with turnover, although the change in the turnover data is not that pronounced, showing an average decline of 7.6 per cent from April to August followed by an increase in December. This contraction in MICL values is partly related to the extension of the scope of eligible collateral and the increase in the portfolio of pledged collateral, i.e. the intraday credit line. On the one hand, the higher liquidity available to VIBER participants in the payment system means that the potentially used credit amount – the utilised credit line – represents a smaller share in the credit line, and on the other hand, it indicates that – despite the decline in the level of the account balance – most VIBER participants were still able to execute their transactions from their account balances.

The queuing of VIBER transactions also shows a sharp fall resulting from the changes in monetary policy instruments. It is not enough to assess the impact of the toolkit modifications effected in March and April 2020 on queues simply by comparing the average monthly number of queuing transactions in the first two months of the year to the number of cases observed in the rest of the year. Based on this approach we would find that the changes in the central bank toolkit would have increased the number of queuing transactions by 36 per cent. When the number of queuing transactions in the first two months of 2020 is compared to the corresponding number in the third and fourth months, we find a 25-per cent increase. It is important to note, however, that the vast majority of queuing in 2020 was linked to the liquidity management of a single VIBER participant. Once that particular participant is excluded from the data, it becomes clear that after the changes to the central bank toolkit, the number of queuing transactions dropped by 43 per cent on average in the last 10 months of the year. Compared to the third and fourth months alone, the decline is 55 per cent. It can be said that changes in the central bank toolkit led to a smoother flow of payment transactions in the VIBER system, which, again, was a larger change than that seen in turnover data, where a decline of 5.8 per cent and an increase of 7.2 per cent can be observed, respectively.

3.2. The year 2021

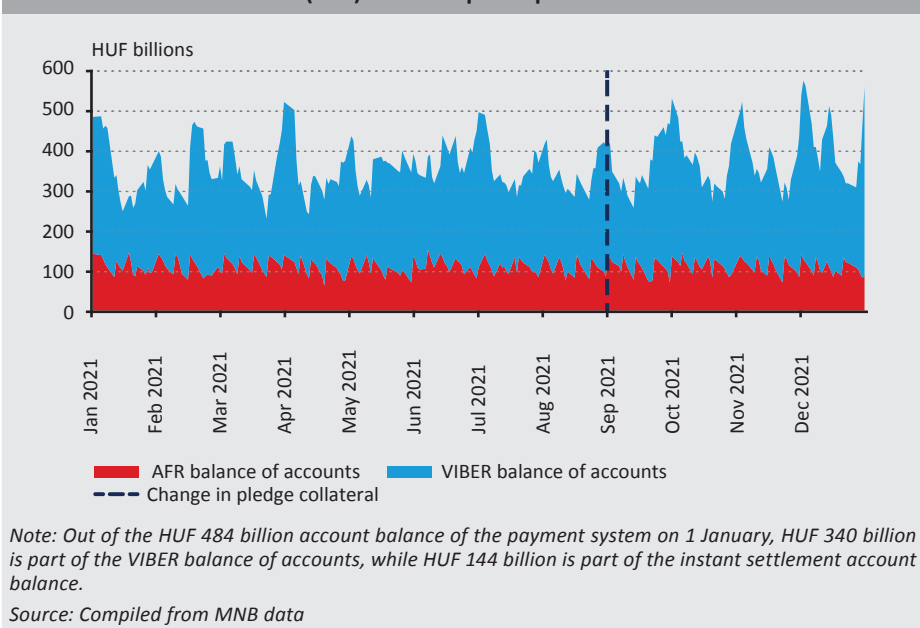
Relative to 2020 and 2022, 2021 was a calmer period in terms of changes to the central bank toolkit. The scope of eligible collateral was modified: from 1 September 2021, investment units were no longer accepted as eligible collateral.

¹⁵ The figure of 12.3 per cent recorded in April 2020 was the highest value seen since January 2014, and the average monthly MICL value of VIBER members was low – adequate – overall, which points to the liquidity adequacy of the system.

The payment liquidity of VIBER participants decreased in 2021, but it was still sufficient to handle their payment transactions. The level of VIBER participants' payment liquidity fell by around HUF 500 billion to HUF 2,200–2,300 billion reflecting a decline in the intraday credit line, which could not be offset by the gradual increase in the account balance. In comparison, there was no significant decline in extended liquidity, which stagnated with minor fluctuations at around HUF 4,500 billion, as the decline in the intraday credit line was offset by the increase in the intraday availability of preferential deposits and O/N deposits during the year (Figures 7 and 8).

The instant settlement account balance showed a cyclical, roughly weekly replenishment pattern during the year, which was influenced by the flow of instant transactions. Thus, during the year, it stood at a level of HUF 100–150 billion, unaffected by the toolkit modification (Figure 7).

Figure 7
Aggregated, midnight account balance and aggregated, midnight balance of the instant settlement account (AFR) of VIBER participants – 2021



By the end of November, the intraday credit line gradually dropped to HUF 1,800 billion from HUF 2,400 billion at the beginning of the year before stabilising at HUF 2,000 billion by the end of the year. The reserve requirement ratio remained unchanged in 2021, but the level of the midnight account balance kept in VIBER increased steadily, fluctuating between HUF 150 billion and HUF 450 billion (MNB 2022a). The change in monetary policy instruments also had no material impact

on the account balance or liquidity, but the weak correlation of 0.58 between the account balances (payment account balance and instant settlement account balance) and liquidity in the first eight months of 2021 strengthened to a correlation of 0.85 in the last four months of the year. That notwithstanding, the change in the scope of eligible collateral had no material impact on the correlation for the reasons explained below. The midnight account balances – including short-term deposits – and the extended liquidity value show significant volatility throughout 2021 due to changes in the stock of preferential deposits. The stock of preferential deposits fluctuated between HUF 1,276 billion and HUF 2,906 billion during the year, but the fluctuations were also driven by the volatility of O/N deposit stocks, with minimum-maximum values ranging between HUF 17 billion and HUF 800 billion. In respect of correlation between the midnight account balances – including short-term deposits – and the extended liquidity value, the toolkit modification had no significant impact: while the correlation for the first eight months of 2021 is 0.96, the correlation for the last four months of the year after the modification is 0.99, which can be attributed to the high volume of preferential deposits and O/N deposits, as in 2020 (Figure 8).

Figure 8
Aggregate midnight and extended account balances and liquidity of VIBER participants – 2021

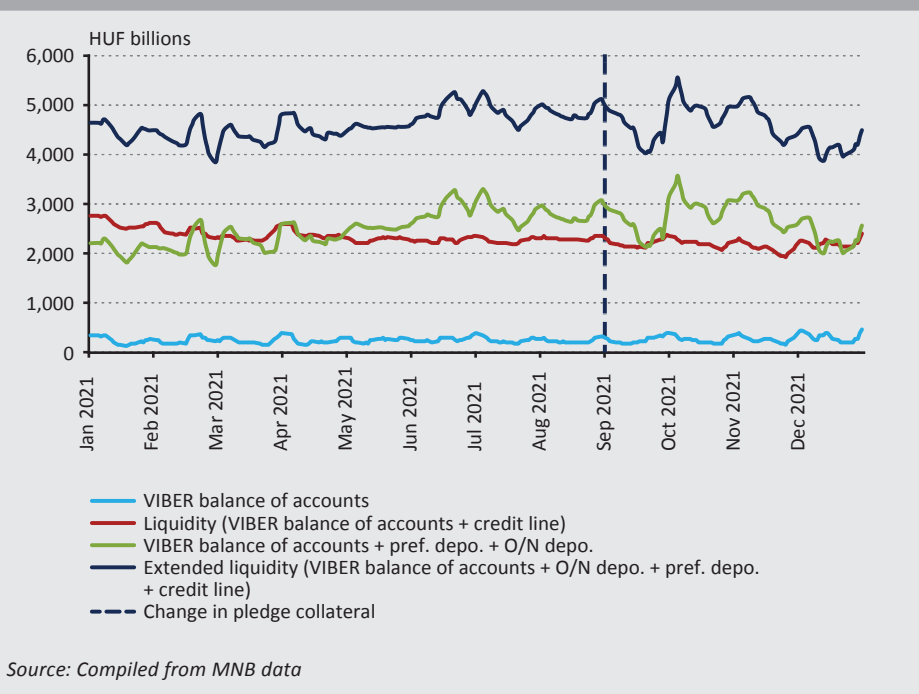
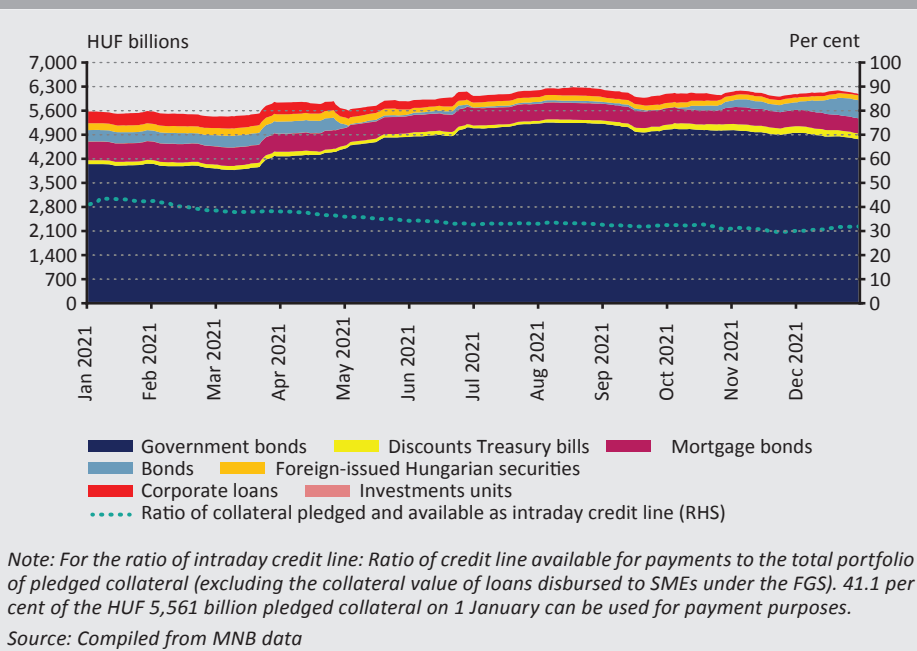
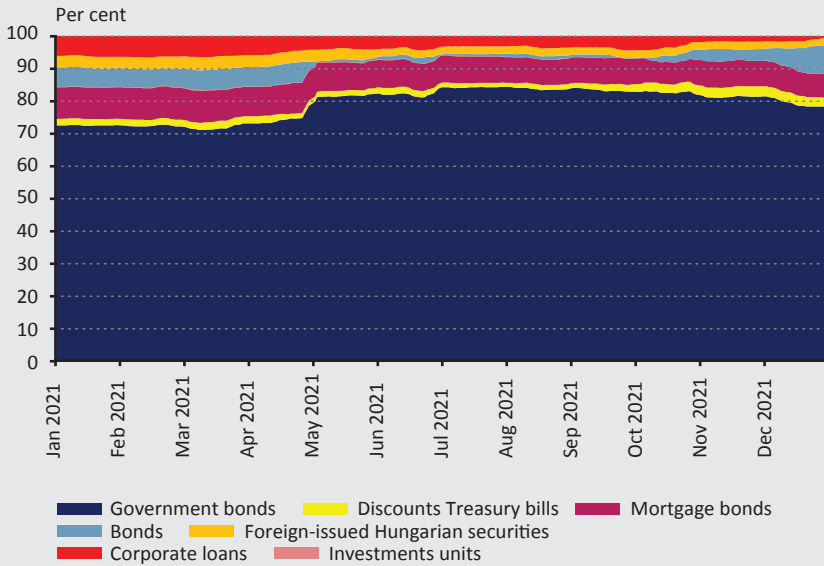


Figure 9
Ratio of pledged collateral to the intraday credit line – 2021



The change in the scope of eligible collateral effective from 1 September 2021 had no material impact on the liquidity of the payment system. Starting from 1 September, HUF-denominated investment units were excluded from the scope of eligible collateral, representing HUF 7.3–HUF 7.6 billion since the beginning of their eligibility on 29 May 2020, and thus accounting for 0.09–0.15 per cent of the total portfolio of pledged collateral over the 15-month period. The removal of forint-denominated investment units from the scope of collateral did not have a material impact on the liquidity of the payments system as a whole. It is important to note that, although the total stock was linked to a single VIBER participant, in the case of that participant investment units accounted for only 1.87 per cent of pledged collateral on average (29 May 2020 – 1 September 2021). As a result, the modification did not give rise to liquidity risk even at the individual participant level, nor did it result in queues. The composition of the pledged collateral behind the intraday credit line has changed somewhat. Starting from April 2021, the share of government bonds gradually increased by 10 percentage points to reach 80 per cent of pledged collateral, while the share of corporate loans contracted sharply (Figures 9 and 10).

Figure 10
Breakdown of the composition of the pledged collateral portfolio – 2021



Source: Compiled from MNB data

Similarly, the toolkit modification had no significant impact on the MICL value of VIBER participants during the year, although the monthly averages of the maximum utilisation of intraday credit line showed an increase after the modification: the monthly average rose to 6.2 per cent in September and 7.7 per cent in October from the average of 5.3 per cent recorded in August. However, for the reason explained in the previous paragraph, the reduction of the scope of eligible collateral had no significant systemic impact on the evolution of credit line utilisation. The trend in turnover values is consistent with the change in MICL values, with a 6.4-per cent increase in September and another 3.6-per cent increase in October relative to the average recorded in August. However, the average MICL value of the participant applying investments units rose to 0.357 in the first two weeks of September from 0.312 in the last two weeks of August, partly reflecting the reduced daily credit line resulting from the toolkit modification.

3.3. The year 2022

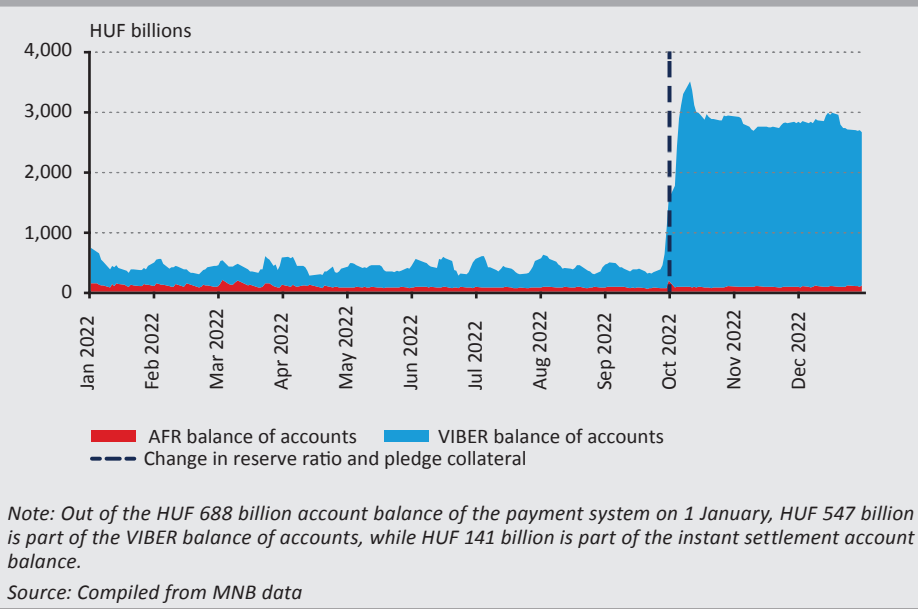
In 2022, the MNB implemented significant modifications to its monetary policy instruments in order to maintain price stability, to keep the closely related interbank liquidity at an optimal level (*Ganley 2002*) and to reduce the impact of financial market turbulence on price stability. The Monetary Council decided to adopt a number of measures to sterilise interbank liquidity, such as raising the reserve requirement ratio to 5 per cent and putting into effect once again

the legal consequences of non-compliance, activating the long-term liquidity-absorbing deposit¹⁶ and including it in the scope of eligible collateral, activating the QuickTender, and phasing out the one-week deposit and the preferential deposit.

In VIBER, the liquidity level of the payment system remained relatively stable in the first three quarters of 2022, at HUF 2,500 billion on average. However, by the end of September the account balances and intraday credit lines of VIBER participants began to rise substantially. The liquidity of the payment system exceeded HUF 7,500 billion by 10 October and remained at a level of HUF 6,000–7,000 billion until the end of 2022. Starting from October 2022, both the level of extended liquidity and the level of account balances – including short-term deposits – show a significant increase, with the former rising from HUF 3,000–4,000 billion to more than HUF 12,000 billion by early December (*Figure 13*).

The pronounced increase in the midnight account balance and liquidity can be attributed to the toolkit modification in October 2022. From 1 October 2022, the reserve requirement ratio was raised to a daily minimum of 5 per cent from the previous 1 per cent, and non-compliance with the requirement once again entailed legal consequences. As a result, the midnight VIBER balance of accounts rose from a range of HUF 150–590 billion to a peak of HUF 3,430 billion by 10 October (*Figures 11 and 12*).

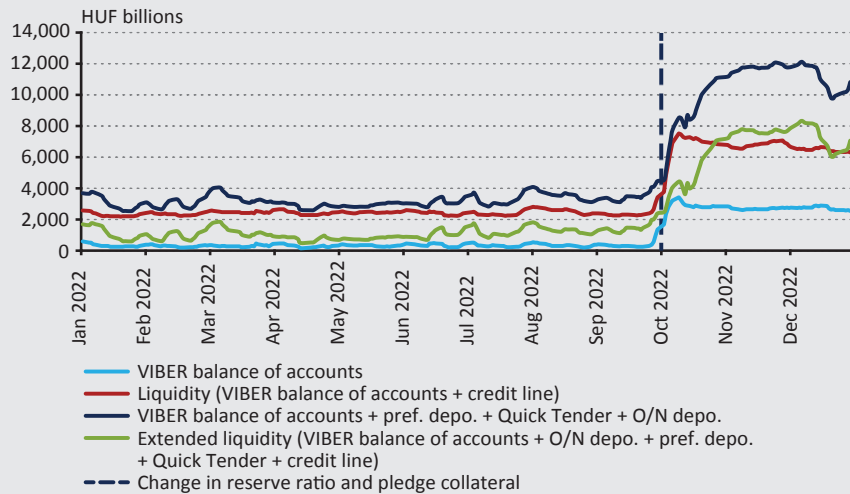
Figure 11
Aggregated, midnight account balance and aggregated, midnight balance of the instant settlement account (AFR) of VIBER participants – 2022



¹⁶ Floating-rate deposit facility with a maximum tenor of 6 months.

The level of the instant settlement account balance was affected, albeit moderately, by the changes in the central bank toolkit, but the magnitude of this change was far below that seen in the VIBER bank account balance. As a matter of practice, in order to comply with the reserve requirement ratio, system members keep their balances on their VIBER accounts rather than on their instant settlement accounts. Members can use the reserve requirement statement in the Instant Payment System ('AFR') to set, on a daily basis, which portion of their instant settlement account should be included in the reserve requirement. In the nine months preceding the toolkit change concerning the reserve requirement ratio (1 January 2022 to 30 September 2022), on average, members held 79 per cent of their reserve holdings on their VIBER accounts and 21 per cent on their instant settlement accounts, and in the three months following the toolkit change (1 October 2022 to 31 December 2022) the corresponding figures were 97 per cent and 3 per cent, respectively. Therefore, it can be said that the sterilised interbank liquidity resulting from the change in the reserve requirement ratio was mainly reflected in the balance of the VIBER accounts and only to a lesser extent in the balance of the instant settlement account balance.

Figure 12
Aggregate midnight and extended account balances and liquidity of VIBER participants – 2022



Source: Compiled from MNB data

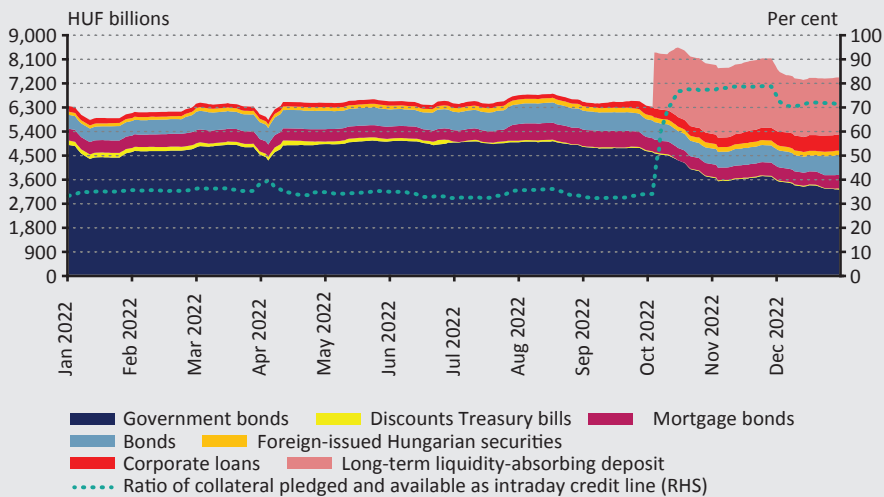
The change in the central bank toolkit did not have a significant impact on the correlation between the midnight account balances (account balance plus instant settlement account balance) and liquidity. While a strong correlation of 0.83 can be observed for the first nine months of 2022, the co-movement remained high for the remaining three months of the year, standing at a value of 0.77. This confirms that the modifications to the central bank toolkit adjusted both the account balance

and the instant settlement account balance, as well as the intraday credit line in the same direction (Figure 12).

The sharp increase in extended liquidity was partly due to the QuickTender activated on 14 October 2022, which amounted to more than HUF 4,000 billion at the end of October, mainly channelled through from the one-week deposit. Despite the significant changes in stock levels, the correlation between the account balances – including short-term deposits – and the extended liquidity did not change notably after October 2022, with a correlation of 0.97 for both the first 9 months and the last 3 months of the year (Figure 12).

The increase in the intraday credit line also played a role in the expansion of liquidity, which rose from HUF 2,000 billion at the beginning of the year to HUF 4,300 billion by mid-October. The composition of the pledged collateral behind the intraday credit line also changed in 2022. From October 2022, the floating-rate, long-term central bank deposit facility (liquidity-absorbing deposit) activated in order to sterilise interbank liquidity was also included as eligible collateral, thus contributing significantly to the increase in the intraday credit lines of VIBER participants and to the rise in payment liquidity. After the toolkit adjustment, the share of government bonds in the scope of eligible collateral declined gradually by 25 percentage points in 2022 Q4, the share of corporate loans increased sharply and accounted for more than 10 per cent of the collateral by the end of 2022, while the share of liquidity-absorbing deposits was close to 30 per cent (Figures 13 and 14).

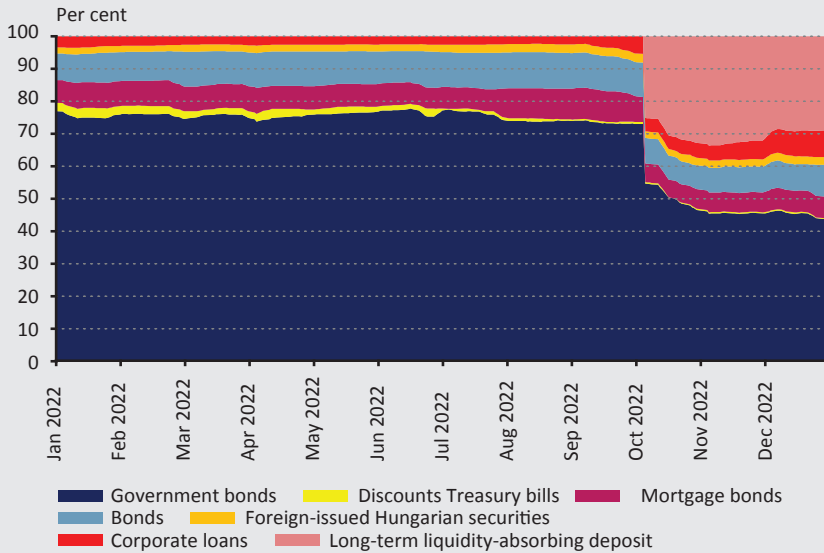
Figure 13
Ratio of pledged collateral to the intraday credit line – 2022



Note: For the ratio of intraday credit line: Ratio of credit line available for payments to the total portfolio of pledged collateral (excluding the collateral value of loans disbursed to SMEs under the FGS). 32.7 per cent of the HUF 6,304 billion pledged collateral on 1 January can be used for payment purposes.

Source: Compiled from MNB data

Figure 14
Breakdown of the composition of the pledged collateral portfolio – 2022



Source: Compiled from MNB data

Thanks to the toolkit adjustment, VIBER participants did not need to use their intraday credit lines at previous levels. Due to the raised reserve requirement ratio and the resulting rise in the balance of VIBER accounts, the MICL rate of VIBER participants with a higher level of liquidity declined to 1.2 per cent on average in the last three months of the year from 7.6 per cent on average in the first nine months of 2022, despite the fact that compared to the average turnover of the first nine months of the year, turnover rose by 31.8 per cent on average in the last three months of the year.

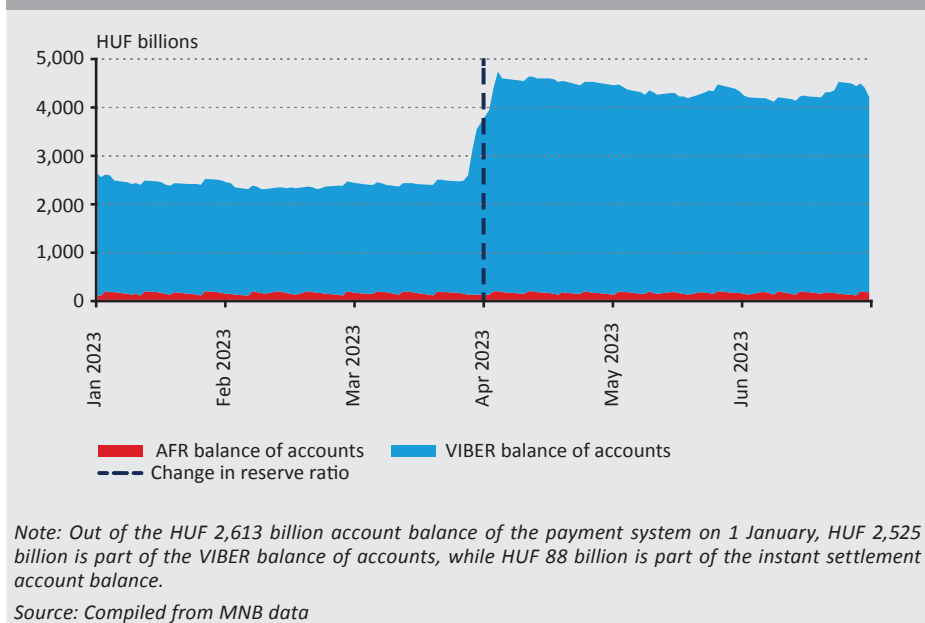
After September 2022, there were hardly any queuing transactions. After the reserve requirement ratio was raised to 5 per cent from 1 October, queuing fell by 66 per cent in the last three months of the year compared to the average for the first nine months of the year. The cases that did occur were also mainly due to a single participant's liquidity management deficiencies. Excluding the participant concerned, average monthly queuing decreased by 94 per cent after the toolkit adjustment from 1 October (1 October – 31 December 2022) compared to the first nine months of the year, which was not reflected in developments (a decline) in turnover.

3.4. 2023 H1

From a central bank perspective, in addition to achieving and maintaining price stability and reducing the impact of financial market turbulence, the primary objective in the first half of 2023 was to normalise the extraordinary interest environment introduced in October 2022, and with that in mind, the MNB implemented another series of toolkit adjustments. Besides cutting the key policy rate, the Monetary Council also decided to sterilise interbank liquidity by raising the reserve requirement ratio to a daily minimum of 10 per cent from 1 April.

In VIBER, the liquidity level of the payment system remained relatively stable in the first half of 2023 and stood at HUF 6,300 billion on average, but the midnight balance of accounts rose substantially after 1 April 2023 as the reserve requirement ratio was raised to a daily minimum of 10 per cent. The midnight balance of VIBER accounts rose to HUF 4,200 billion from the average level of HUF 2,260 billion recorded before 1 April. For 2023 H1, both the level of extended liquidity and the level of account balances – including short-term deposits – show sharp fluctuations. Account balances – including the QuickTender and O/N deposits – soared to HUF 12,000 billion from the HUF 7,500 billion level recorded at the beginning of the year, while extended liquidity exceeded HUF 14,000 billion (Figure 16).

Figure 15
Aggregated, midnight account balance and aggregated, midnight balance of the instant settlement account (AFR) of VIBER participants – 2023 H1

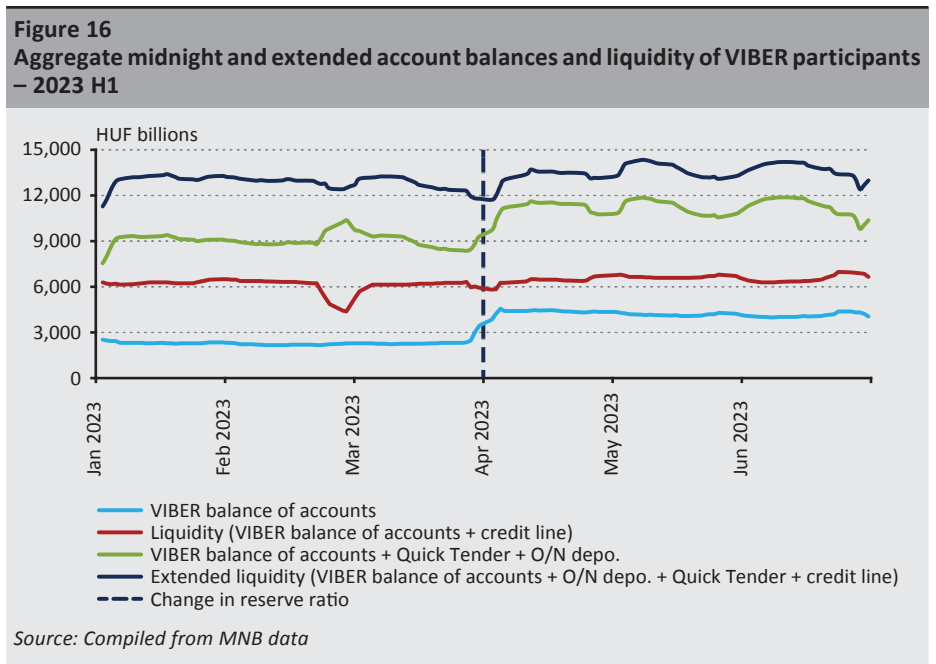


Note: Out of the HUF 2,613 billion account balance of the payment system on 1 January, HUF 2,525 billion is part of the VIBER balance of accounts, while HUF 88 billion is part of the instant settlement account balance.

Source: Compiled from MNB data

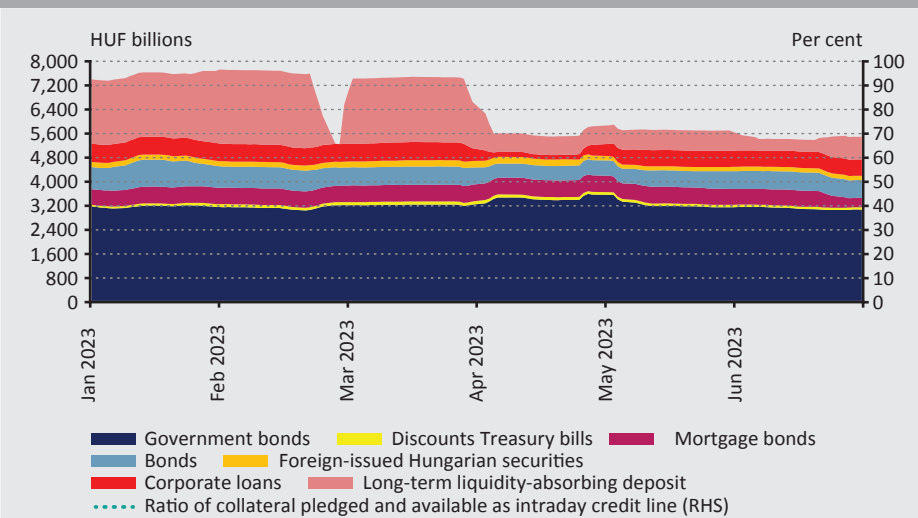
The level of the instant settlement account balance was not significantly affected by the modifications to the central bank toolkit; the instant settlement account balance was HUF 133 billion on average in 2023 Q1 and HUF 141 billion in 2023 Q2. As in 2022, the moderate change was due to the fact that system members keep their balances on their VIBER accounts rather than on their instant settlement accounts as a matter of practice, in order to comply with the reserve requirement ratio (Figure 15).

The change in the central bank toolkit strengthened the correlation between the midnight account balances (account balance plus instant settlement account balance) and payment liquidity, albeit not significantly, with a correlation of -0.007 in 2023 Q1 and 0.26 in 2023 Q2. This change is mainly due to the fact that, while the level of liquidity-absorbing deposits in the pledged collateral making up the intraday credit line showed a high degree of fluctuation at the end of February 2023, the second quarter of the year was characterised by a lower but more stable level. However, the correlation between account balances – including short-term deposits – and extended liquidity changed significantly following the central bank toolkit modifications. While a correlation of 0.45 was observed in 2023 Q1, a strong correlation of 0.9 was seen in Q2 as a result of a decline in the intraday credit line (and thus its share in extended liquidity), while both the value of VIBER’s overnight account balances and the value of QuickTenders increased in Q2 (Figure 16).



The stagnation of liquidity was driven by a decline in the intraday credit line and an increase in the midnight balance; the former fell to HUF 2,600 billion at the end of Q2 from HUF 3,700 billion at the beginning of the year. The composition of the pledged collateral behind the intraday credit line also changed in 2023 H1. The portfolio of the floating-rate, long-term central bank deposit facility (liquidity-absorbing deposit), activated in order to sterilise interbank liquidity, contracted significantly in H1: while it reached HUF 2,135 billion at the beginning of the year, it was down to HUF 616 million by the beginning of April and HUF 391 million by mid-June. As a result, the distribution of the pledged collateral behind the intraday credit line also changed significantly, with government bonds accounting for a share of over 50 per cent once again, while the share of liquidity-absorbing deposits dropped to less than 15 per cent by the end of H1 (Figures 17 and 18).

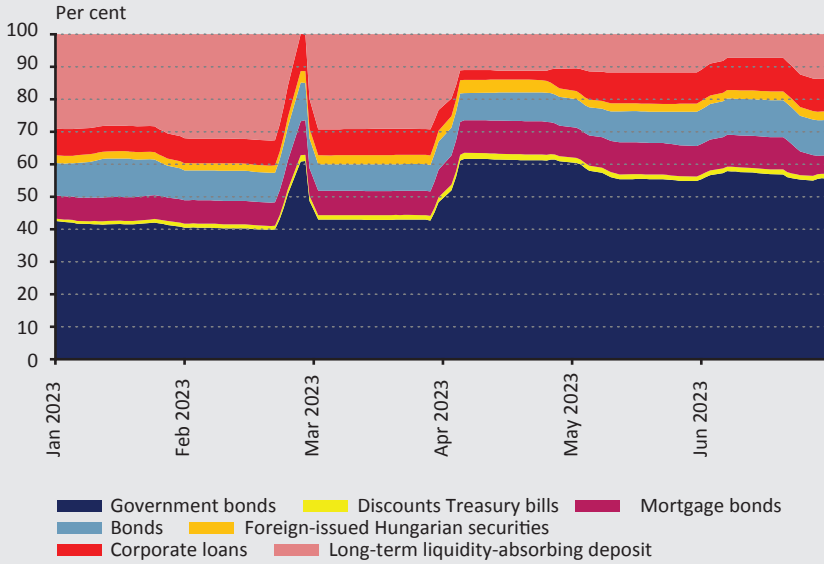
Figure 17
Ratio of pledged collateral to the intraday credit line – 2023 H1



Note: For the ratio of intraday credit line: Ratio of credit line available for payments to the total portfolio of pledged collateral (excluding the collateral value of loans disbursed to SMEs under the FGS). 70.9 per cent of the HUF 7,346 billion pledged collateral on 1 January can be used for payment purposes.

Source: Compiled from MNB data

Figure 18
Breakdown of the composition of the pledged collateral portfolio – 2023 H1



Source: Compiled from MNB data

Thanks to the toolkit modifications, the maximum utilisation of the intraday credit lines of VIBER participants fell further from the low levels seen at the end of 2022. Owing to the raised reserve requirement ratio as of 1 April and the resulting increase in the VIBER account balance, the MICL value of VIBER participants decreased to 0.60 per cent on average in 2023 Q2 from 0.87 per cent on average in 2023 Q1, despite no significant change in turnover during Q1 and Q2, as turnover of HUF 15,150 billion per day was recorded on average in both quarters.

After September 2022, queues were almost non-existent; however, this trend was broken in 2023 H1, mainly owing to three VIBER participants as they accounted for almost 80 per cent of all queuing transactions. The reserve requirement ratio, which was raised to a daily level of 10 per cent from 1 April, failed to reduce queuing significantly. Excluding outliers, data indicate that the number of queuing transactions is below 30 per month with no significant change since April; consequently, we assume that the occasional queues are more likely to reflect inappropriate liquidity planning by the participants concerned, rather than a general lack of liquidity.

4. Summary

In order to ensure financial stability and the smooth functioning of payment and settlement systems, the MNB has at its disposal a wide range of instruments with diverging effects. Since each element of the central bank toolkit has its own role, the impact of individual modifications on the payment system, including the liquidity of the payment system, will obviously vary. As mentioned in the abstract, the main purpose of central bank toolkit modifications is to ensure the achievement and maintenance of the Bank's primary objective of price stability, which is closely linked to the need to maintain an optimal level of interbank liquidity. By presenting a particularly turbulent period, this analysis sought to provide an insight into a number of changes in the central bank toolkit that exerted a significant impact on the liquidity of the payments system. Experience confirms that, subject to the relevant business conditions, changes concerning the reserve requirement ratio have a direct impact on the liquidity of the payment system, which was foreseeable as it is directly related to the account balance; nevertheless, the value of the reserve requirement ratio has changed only 10 times since the turn of the millennium until mid-2023. Other significant changes to the central bank toolkit with a direct impact may include measures to increase interbank liquidity and to nudge one-week deposit holdings to overnight deposit facilities, as well as changes to the scope of eligible collateral, as pledged collateral is linked directly to the intraday credit line.

Some toolkit adjustments had little or no impact on payment liquidity, such as the fixed-rate collateralised loan instrument introduced on 24 March 2020, which partly served to improve banks' funding structure, and partly stimulated investment in long-term fixed-rate instruments but in our assessment, the increased interbank liquidity generated by the toolkit change was not channelled into payment system liquidity directly. Similarly, the one-week deposit facility activated on 1 April 2020, bearing interest at the central bank base rate, was intended to sterilise interbank liquidity, but did not have a direct impact on the liquidity subject to our analysis. Since the inception of the Funding for Growth Scheme and the Bond Funding for Growth Scheme, a preferential deposit has been included as an integral part of the schemes to ensure the sterilisation of the interbank liquidity they generate. While the preferential deposit is not included in the scope of eligible collateral, the overnight nature of the instrument means that the funds deposited can be used by participants for payment transactions throughout a significant part of the settlement day.

The potential effects of any changes to the monetary policy toolkit should be analysed and assessed on a case-by-case basis in consideration of all circumstances, to ensure the continued reliable operation of the payment system. Based on the experience of the past few years, it is important to stress that even at liquidity levels significantly lower than those seen at the time of the analysis, payment transactions would be smoothly processed in the payment systems of Hungary; in other words, there is ample liquidity available to process electronic payments in the domestic economy.

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